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Center for Information Systems Research

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ABSTRACT

This paper explores the nature of strategic goals underlying composite information systems (CIS) and ways to increase their likelihood of success. It studies a major regional hospital and its relationships with its physicians as part of a case study for providing physicians and staff convenient interface to disparate hospital departments. This situation is a particularly appropriate CIS example, involving loosely-coupled and inter-dependent relationships (i.e., the physicians can affiliate with any hospital they want). Three approaches to motivating strategic alliances are identified: bi-directional benefits, co-operative payoffs, and asymmetrical control. Examples illustrate how these approaches were used in the design and implementation of the hospital's CIS.

KEY WORDS AND PHASES: Strategic alliances, composite information systems, inter-organizational information systems, information systems for competitive advantage.

1. INTRODUCTION

The combination of turbulent global economy with increased competition and recent advances in computer and communications technologies have generated significant interest in, and successful examples of, using such information technology (IT) for strategic applications [8]. Many of these strategic applications require inter-organizational systems (e.g., to connect with suppliers and/or buyers) or more integrated intra-organizational systems (e.g. to connect together disparate parts of the business). In either case, we refer to such systems as Composite Information Systems (CIS). Any effort to plan and implement a CIS must deal with the issue of motivating strategic alliances among the participants.

This paper uses the experience of one organization, a major regional hospital, to illustrate this issue. We analyze the hospital's market position and key aspects of its organizational structure. The cooperative and incentive-based aspects of boundary-crossing CIS receive particular attention. We suggest three elements to emphasize when formulating strategies for CIS design success: 1) bidirectional benefits, 2) cooperative payoffs, and 3) asymmetrical controls. We suggest that these concepts define internal incentives that are particularly appropriate to CIS development.

The sections that follow

i) briefly discuss external and internal motivations,
ii) introduce the three concepts to support internal motivation,
iii) introduce the hospital and its CIS,
iv) discuss the concepts as illustrated by this CIS,
v) suggest a means for identifying key incentives and linkages, and
vi) present our conclusion

1.1 External versus Internal Motivation

Incentives fall into two categories: external and internal. External incentives include elements of force, coercion, and threat; they can be summarized as pressure for system use imposed from outside or above. A chief executive or system sponsor may attempt to command subordinates to use the system.

There are several disadvantages to such external motivation. First, if the subordinates do not receive benefits (or even worse, perceive threats to themselves) they can find various surreptitious ways to sabotage a system. As one top executive commented about such approaches, "you have no idea how little power a president really has."[1] Second, in a CIS environment we are attempting to form alliances between loosely-coupled participants [6,5], whether inter-organizational or intra-organizational. Thus, there usually does not exist a strict power hierarchy through which such external incentives may be delivered. This can be particularly important since a system champion who has been successful with implementing systems within his or her own organization through external incentives or a shared organizational goal may be ill-prepared to operate in a CIS environment.

Internal incentives, on the other hand, are those that encourage the participation of each party on a "what's in it for me" basis.

It is important to note that it is often the case that the benefits may not be the same for all participants. For example, let us consider the innovation in the newspaper industry of direct entry of a reporter's story into a computer system through terminals. The publishers were motivated primarily by the desire for cost savings through partially eliminating typesetting costs. The reporters were initially reluctant to cooperate since there was no stated benefit to them, and since the system would require them to learn new skills; furthermore this system would eliminate the jobs of many of their union supporters, the typesetters. This resistance was overcome largely by examining reporters' goals. Two major concerns to reporters related to timing: 1) early deadlines for story submission and 2) the delay between story submission and its appearance in print. By pointing out the ability of the new

system to reduce the time from submission to printing and, correspondingly, increasing the time until submission deadline, considerable compelling benefit was perceived by the reporters. Thus, we see that the same system provided very different benefits to the participants: cost savings to the publisher and time adjustments to the reporter.

Internal incentives tend to be supportive rewards that lead to self-perpetuating system use. Persons using the CIS under conditions of internal incentives clearly perceive circumstances in which the system helps them fulfil their responsibilities more efficiently or effectively.

1.2. Strategic Design for Internal Motivation

Because a CIS by definition tends to work across traditional organizational boundaries, CIS design must deal directly with difficult organizational problems involving conflicting interests and perspectives. Three types of internal incentives are particularly useful for the design of CIS under such circumstances. We refer to these as bidirectional benefits, cooperative payoffs, and asymmetrical controls (see Figure 1).

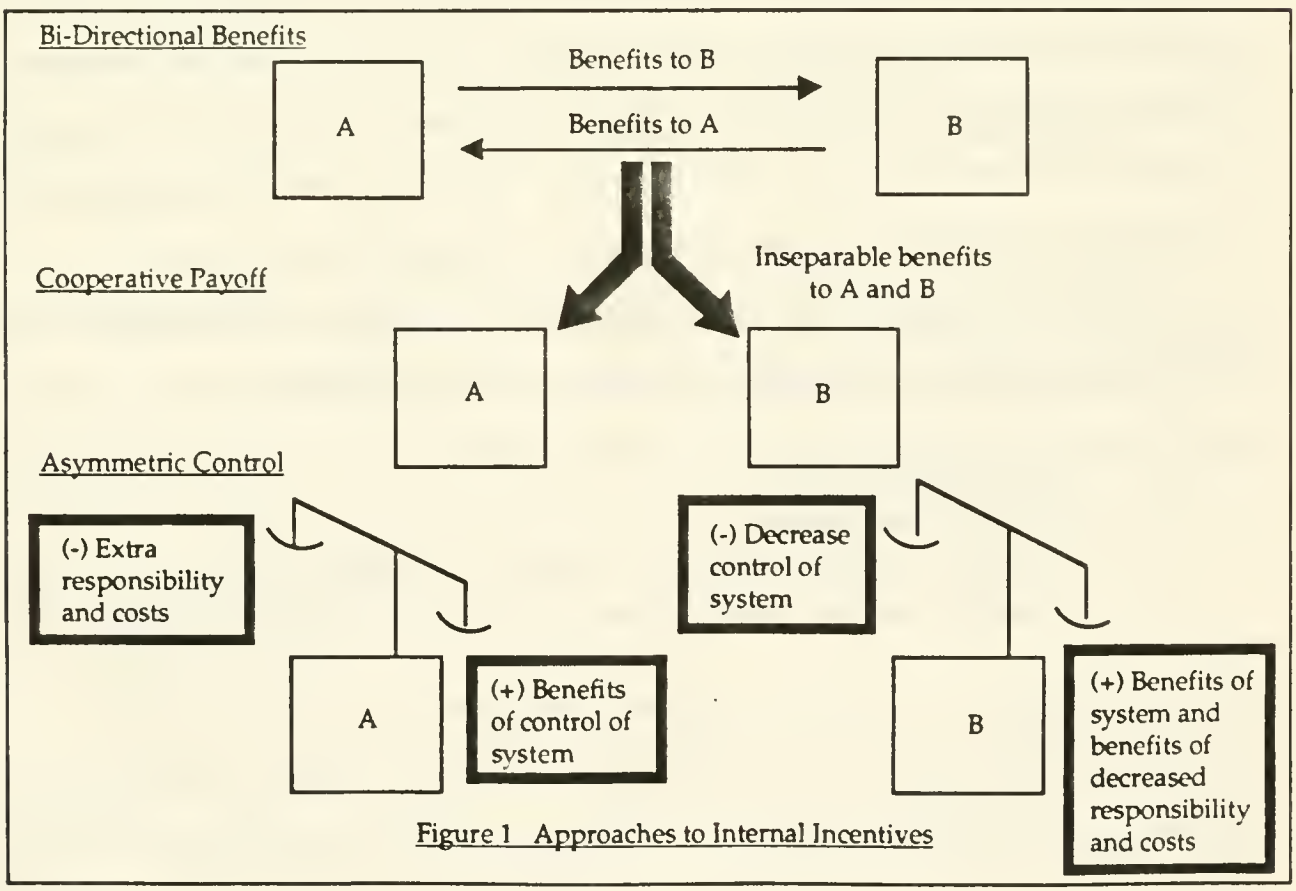

Figure 1 Approaches to Internal Incentives

1) Bidirectional Benefits - CIS appear to be more successful when both parties -- on either side of the organizational boundary that the system crosses -- clearly see "what's in it for me." Here advantages accrue to each party individually; we tag them "bidirectional" because we can clearly identify a related benefit to each participant. Each can see that there is "something in it for me," even though the "something" may be different.

2) Cooperative Payoffs - The idea of cooperative payoffs is based on the notion that the CIS provides benefits to participants in aggregate as well as individually. The terms emphasize that successful CIS design can offer collective (as opposed to individual) advantages that encourage parties associated with the CIS network to use it. Cooperative payoffs can provide inseparable benefits to possibly adversarial system participants in much the same way that the payoff in a prisoner's dilemma game can reward mutual cooperation [1].

3) Asymmetrical Control - In any CIS setting the issue of who controls the system is important. Standards can be difficult to implement when many disparate groups are involved [18]. Under certain circumstances, however, it may be possible to build dependencies that are of strategic importance by keeping control of the system. This may occur when one party involved, for example, benefits from the message content of the network but not from its physical control, while the other party gains from controlling the network without regard to message content.

These three types of internal incentives operate within the stages of the CIS process model depicted in Figure 2 [9]. The model suggests a four-stage approach to CIS design:

1. Specify strategic goals;
2. Identify an appropriate CIS;
3. Identify technical and organizational problems associated with that CIS;
4. Apply organization theories and information technology to solve the problems.

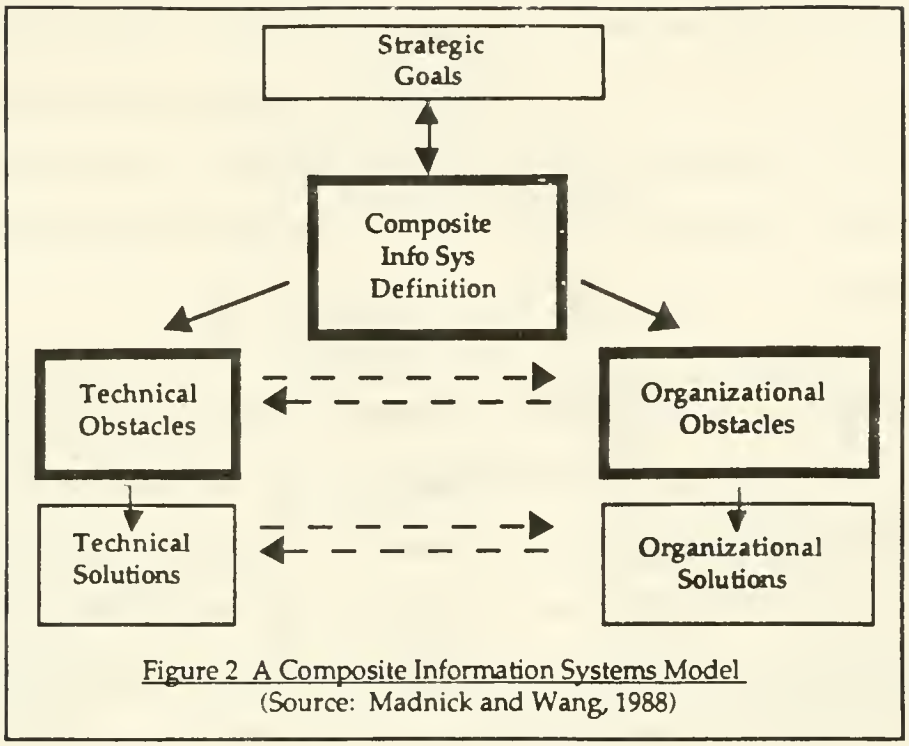

Figure 2 A Composite Information Systems Model
(Source: Madnick and Wang, 1988)

At the highest level are strategic considerations. In the following example we will see industry conditions and operating limitations constraining hospital manager's strategic choices. The market analysis framework adapted from Porter [13] gives a method from categorizing strategic choices and selecting among them.

As strategic goals become better defined, the characteristics of the CIS environment increasingly depend on the organizational problems which impede the execution of these strategic choices. Particularly important at this level are the local interests prevailing within particular organizational boundaries. Internal incentives based on bidirectional benefits, cooperative payoffs, and asymmetrical control provide opportunities for CIS design to bridge organizational barriers and to link those interests successfully.

2. HOSPITAL CASE

The hospital example was chosen specifically because it illustrates the complexities faced by system designers in dealing with competing organizational interests, and because it demonstrates that effective design solutions to such problems need be neither technically complicated nor extremely expensive.

The hospital in question is a large and successful organization. It has over 40% (774 beds) of the licensed beds in its region; its bed utilization rate of 71% compares favourably with the 68% of its closest competitor; it represents the tertiary care facility of choice for over 1,000 physicians. The institution itself is the flagship facility for one of four dominant multi-hospital systems in a large Midwestern city.

2.1. Hospital Goals

The hospital's CIS is known as the Professional Information Network (PIN). The PIN system represents the hospital management's latest strategy for building inter-organizational bridges between the hospital and its attending physicians' practices. The hospital's managers believe that strengthening loyalties between physicians and the hospital is an issue of strategic importance.

Their perspective is based on changes in the health care market in the institution's local area. Competition for patients is increasing, intensifying the importance of patient volume and market share. Negotiated pricing is being encouraged by Health Maintenance Organizations (HMOs). In the region HMOs represent 50% of the patient population, compared with 10% nation-wide. These factors have combined with rising operating costs to put hospital revenues and profits under serious pressure. Other hospital chains located nearer to affluent portions of the city have an advantage when targeting low-risk HMO patients. New competitors are appearing. Free-standing clinics siphon off high-revenue, low-risk procedures (such as radiology). Primary-care hospitals are attempting to develop their own specialties. Smaller hospitals are consolidating with large multi-hospital organizations as their financial conditions worsen. These competitive threats can be summarized using the market framework introduced by Porter [12], in terms of a combination of five forces: 1) rivalry among existing competitors, 2) threats from new entrants, 3) increasing bargaining power from buyers, 4) increasing pressure from suppliers, and 5) a proliferation of substitute services. The specific situation for this hospital is depicted in Figure 3.

The hospital's managers have isolated the critical aspects related to each of these competitive threats and have developed strategies for countering them. The institution intends to bolster market share and patient volume by building its reputation among physicians and its image as a specialty health-care institution among the public.

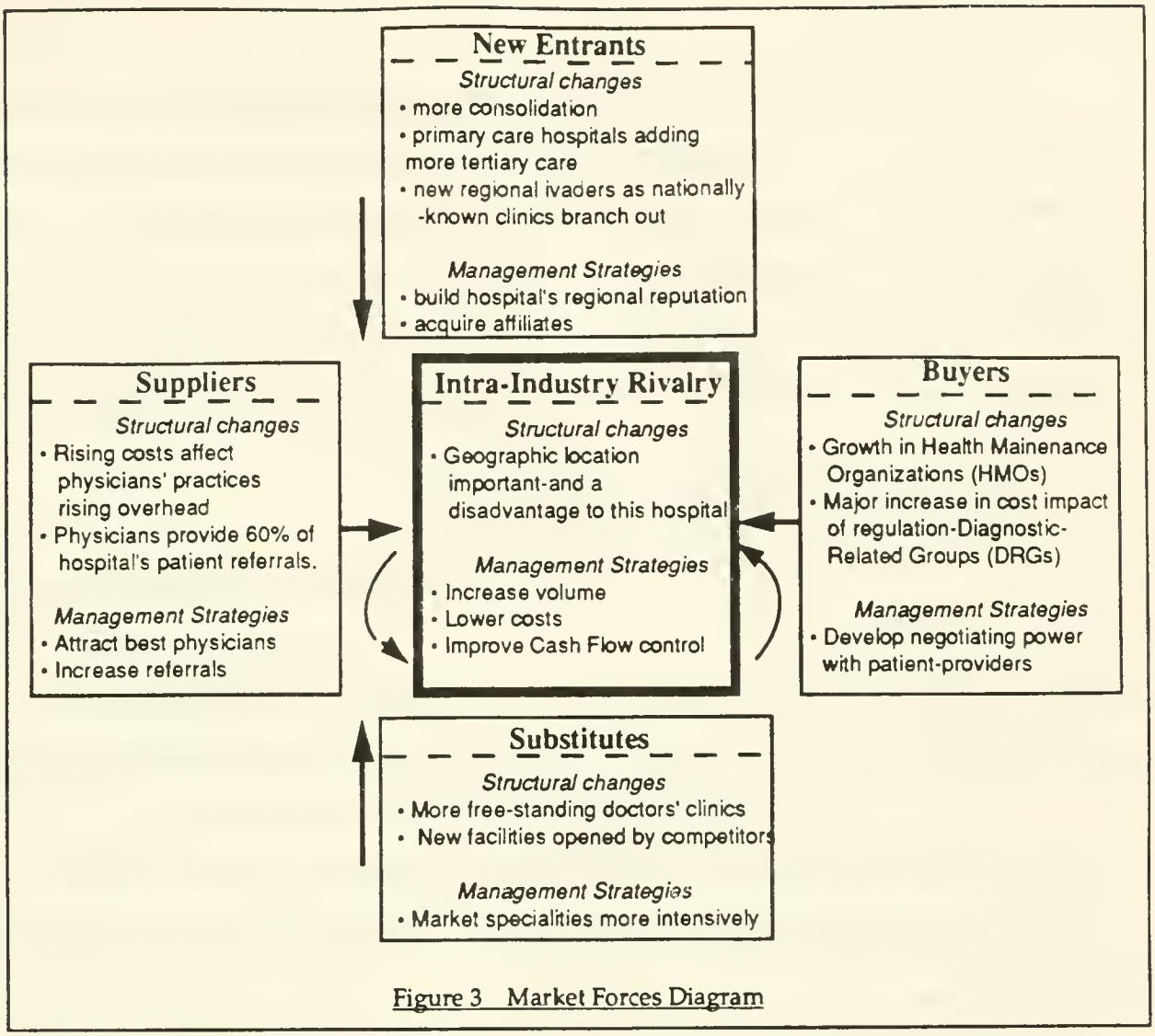
New Entrants
Structural changes
• more consolidation
• primary care hospitals adding more tertiary care
• new regional ivaders as nationally -known clinics branch out
Management Strategies
• build hospital's regional reputation
• acquire affiliates
Suppliers
Structural changes
• Rising costs affect physicians' practices rising overhead
• Physicians provide 60% of hospital's patient referrals.
Management Strategies
• Attract best physicians
• Increase referrals
Intra-Industry Rivalry
Structural changes
• Geographic location important-and a disadvantage to this hospital
Management Strategies
• Increase volume
• Lower costs
• Improve Cash Flow control
Buyers
Structural changes
• Growth in Health Mainenance Organizations (HMOs)
• Major increase in cost impact of regulation-Diagnostic-Related Groups (DRGs)
Management Strategies
• Develop negotiating power with patient-providers
Substitutes
Structural changes
• More free-standing doctors' clinics
• New facilities opened by competitors
Management Strategies
• Market specialities more intensively

Figure 3 Market Forces Diagram

Patient referrals are a key method for building volume. Because physicians are responsible for more than half of referrals, the physician relationship becomes a key strategic factor in maintaining the hospital's financial health. It is in the organization's strategic interest to bind its physicians as tightly to the hospital as possible. Services provided by the hospital that save the physician time or that reduce the overhead associated with the physician's practice thus assume strategic importance.

Regulatory developments suggest, moreover, that as time passes the hospital will have to ask physicians for increasing amount of proprietary data in assembling cost estimates for pricing negotiations. If the hospital can provide important services to its physicians over an electronic network while simultaneously acclimating its physicians to the convenience of electronic data transmittal, the institution can initiate a linkage that will grow in competitive importance over the next decade. PIN represents an attempt to accomplish these goals.

2.2. Physician Goals

At the same time that the hospital is facing these threats, the physicians are very concerned about rising overheads in their practices. With increasing paperwork requirements forced by the pressure of malpractice, higher insurance premiums, increasing clerical salaries, and high office expenses of all types, overhead threatens to exceed 60% of a physician's revenues. These factors have led to a new focus on the part of many physicians: cutting the costs of their own businesses. This means looking more closely at the costs of running their own offices and opportunities to improve efficiency and and searching for new effectiveness.

3. THE PROFESSIONAL INFORMATION NETWORK

The Professional Information Network (PIN) system is primarily inter-organizational in scope and provides seven core services:

1) The electronic mail service links physicians offices with the hospital and with each other;

2) The referrals service routes patient referral information between physicians and the hospital;

3) The lab status service allows physicians to request lab tests and obtain results;

4) The pharmacy service takes orders for medications and advises on new dosages and drugs;

5) The pre-admission and operating room scheduling services allow physicians' offices to contact hospital staff electronically with information important to hospital work flow and cost control;

6) The consultation request service allows physicians to contact each other, via the network, to schedule inter-physician consultations;

7) The library application service allows physicians to send notes to the hospital's librarians asking for database searches on chosen medical topics. The result of the searches -- article abstracts and studies -- are sent back to the physicians by electronic mail.

As a Composite Information System, PIN crosses both interorganizational boundaries (from hospital to physician's offices) and intraorganizational divisions (between hospital departments). PIN is attempting to initiate access to distributed sources of data and to provide a standardized "data highway" for all of the hospital's constituencies.

PIN exists to establish connectivity between independent systems. It spans "product areas" within the hospital by providing the physician a common interface to many hospital services. As such, PIN exhibits important CIS characteristics:

1. It derives its value from specific cross-boundary linkages (hospital to physician, hospital department to hospital department, physician to physician).
2. It allows asynchronous coordination of potentially conflicting interests and procedures.
3. Its operating details are largely transparent to its target audience (the physicians).
4. It is used by its developer (the hospital) as a partial solution to specific strategic problems (physician satisfaction referrals and patient volume, operating cost control).

4. MOTIVATING STRATEGIC ALLIANCES

The hospital's PIN relies on internal incentives for its design success. Some examples of how these internal incentives were applied are illustrated briefly below. A more detailed description of the key PIN applications is presented in section 5.

4.1. Bidirectional Benefits

PIN's referral system provides an example of bidirectional benefits by giving both hospital and physicians individual benefits. If a physicians refers a patient to the hospital, the hospital benefits. If the hospital refers a patient to a physician, the physician benefits.

By realizing the reciprocal benefits to be gained by each party to this relationship, a basis for sustained internal motivation can be established. In the particular example described above, the nature of the benefits for each participant (i.e., referrals) is similar. This is not necessarily the case in all PIN applications.

4.2 Cooperative Payoffs

Physicians want to use the hospital's pre-admission and operating room scheduling system because it saves them time and frustration on the telephone. The physician's offices run more smoothly, scheduling is more efficient, and busy physicians and their staff can spend more time seeing patients and less time dealing with office problems. The hospital gains directly as well; it has a better idea of the scheduling load on its facilities, and it has more flexibility in rescheduling admissions and procedures than it did when requests had to be processed in a single telephone conversation.

Note that the specifics of the benefits to be gained by each party may be, as in this case, different. But neither party benefits unless both participate. If the physicians did not provide the pre-admission information, there would be no way the hospital could gain its improved operational

efficiency. If the hospital did not use the pre-admission information, the physicians would have to use traditional, less efficient, telephone scheduling procedures. By cooperating and coordinating through PIN, both parties achieve a cooperative payoff.

4.3. Asymmetrical control

The hospital's plans to provide services to its physicians hinges at least in part on a desire to develop in physicians the habit of sending information across the network. Hospital managers expect the market to change over the next five years in ways that will force the hospital to ask physicians for increasing amounts of potentially proprietary data. They anticipate that this task will be easier if this information could automatically be captured by the PIN system and if physicians are already familiar with the process. But why should physicians give control of the system to the hospital?

Physicians vary greatly in their systems knowledge and technical interest. Busy with their practices, they probably could not find the time to think about system specifications, much less agree on a single design. Thus, the physicians are willing to give up some control in return for the functional and efficiency benefits provided by PIN and the convenience of having the hospital operate it. By presenting them with a service and essentially controlling the mechanics of the network completely, the hospital can (1) make PIN easy enough to use so that it will be used and (2) encourage physicians to build habits supportive of electronic data transfer. Both aspects of the system are of strategic interest to the hospital, and both arise from the hospital's asymmetric control over PIN's specifications.

5. DESCRIPTION OF PIN APPLICATIONS

This section describes each key PIN application in more detail to illustrate how the internal incentive concepts can be applied.

5.1 Electronic Mail

PIN provides a UNIX-based electronic mail system connecting all system participants. The mail network links physicians' offices with the hospital, with each other, and with selected HMOs. The result has been much better communication of routine news between all parties. This link has been particularly important because many of the hospital's non-surgical physicians have been forced by industry changes to spend less time in the hospital and more in their clinics. The mail network can

reach them and is sometimes more effective than pagers. Because the physicians are not always able to answer their pagers immediately during office hours, messages are more frequently lost during those times.

5.2 Referrals

The hospital provides a number of community services, such and the Medformation Hot-Line. PIN provides the Medformation staff with the ability to enter the information from a caller and refer the caller to an appropriate physician. This is a natural extension of the hospital's efforts to place patients with physicians who practice near them.

The PIN referrals service also routes patient referral information to physicians through the hospital's information network. This routing allows the hospital to capture more marketing information (such as geographic patient concentrations derived from patient zip codes) and more tracking data (such as which physicians are getting what referrals and whether they ultimately make use of hospital facilities) than previous telephone referrals permitted. The growing pool of data is becoming a useful marketing tool for the hospital. It has generated a mailing list of all patients who may potentially pass through hospital facilities. Hospital management knows, by zip code, which areas are short of physicians and may be fertile territory for opening a new practice. The database's listings of physician consultations allows the hospital to pinpoint the best of its physicians. Compilation also shows which physicians bring the most patients through the hospital.

Cross-tabulation of all these factors provides a picture of potential high-quality, loyal physicians. The hospital has made a conscious decision to identify such practicioners especially among its younger physicians, and to invest in such individuals by suggesting locations to open a practice. The hospital has even helped finance the practice until the physician's own patient volume becomes high enough.

5.3 Lab Status

Lab test were previously ordered by surface mail or by pneumatic tube system. Results were returned by mail or by courier. When labs became backed up, delays could stretch for several days on some tests – during which time the physician would have no idea of the test's progress.

Physicians now use PIN's lab status system to request tests and receive results directly from the hospital's labs, saving time and keeping patients better informed. PIN allows for immediate checks on the status of lab results, removing the delay of physical mail-handling once tests are completed. The system reduces the number of times the physician is embarrassed in front of a patient because lab results are inexplicably delayed, lost, or incomplete.

5.4 Pharmacy

The PIN pharmacy system takes orders for medications; advice on new dosages and drugs is also available. Choosing the correct drug and dosage from among the increasing numbers of alternatives available is a steadily more complicated task. The hospital has found that many physicians, pressed for time, develop favorite drugs and dosages over the course of several years. Some of these are less effective than the alternatives, and some are more expensive for the hospital pharmacy to provide than others. The pharmacy system provides a way for the hospital to suggest alternative dosages or drugs in a non-threatening manner. The system also remembers personalized directions for each patient, allowing physicians to provide small but helpful touches to dosages and prescriptions. Lastly, the system provides a record of the latest available formulations so that a physician can refresh his or her memory on particular details.

5.5 Pre-Admission and Operating Room Scheduling

The PIN pre-admission and operating room scheduling systems allow physicians' offices to contact hospital staff electronically with information important to hospital work flow and cost control. When this job used to be done over the phone, physicians' staff members consistently complained of being left on hold and of making multiple calls for one simple task. Scheduling the hospital's 26 operating rooms used to involve a serious bottleneck. For the hospital, it is critically important to run the operating suites at full capacity; they are among the most expensive parts of the facility. For the physician's office, it is critically important to schedule an operation at a time convenient for both patient and physician, and to do so in a manner that allows for flexible schedule changes if needed.

PIN changes the scheduling work flow. Physicians' staff members fill out an onscreen form, which is then immediately available to the hospital's operating room scheduling office. Hospital staffers build the schedule as usual and assigned times are communicated through the e-mail network.

The new system has several advantages: (a) physicians' staffers no longer waste time on the telephone; (b) hospital schedulers have a better idea of operating room load at critical times, and can shift room assignments or make other changes to increase scheduling flexibility (not all operating rooms, for example, are the same size); (c) as a result, operating room schedules appear more flexible; and (d) physicians get scheduling results back faster -- leading to significantly improved relations between the hospital and its physicians.

5.6 Consultation Requests

The PIN consultation request system allows physicians to contact each other, using the hospital's network, to schedule inter-physician consultations. These arrangements increase the physicians' revenues and give hospital managers better data on the flow of consultation work. PIN provides an electronic form for requesting consultations. Delays are less frequent than when arrangements were made through phone calls by physicians' office staffs, and the hospital gains a record of every consultation requested and billed. It can assemble information on which physicians request the most consultations and which are asked most often for a second opinion. It can tell which types of cases are most likely to generate consultations, and so flag serious cases that might generate above-average expense levels. In a highly competitive market, such information assumes strategic importance.

5.7 Library

Lastly, the PIN library application system allows physicians to send requests to hospital librarians for database searches on chosen medical topics. The results of the searches – article abstracts and studies – are sent back to the physicians through PIN's electronic mail. This service has proven especially popular with young physicians who are considering the hospital as a place to base a practice. These young MDs usually come from medical schools that have a search service (although usually without PIN's ease of electronic requests and responses); this aspect of PIN is a strong selling point for PIN.

6. CIS DESIGN BASED ON BENEFITS, PAYOFFS, AND CONTROL

If bidirectional benefits, cooperative payoffs, and asymmetrical control all play a part in the acceptance and usefulness of a CIS, how can system sponsors and designers identify elements that a

system should emphasize? This paper suggests an approach to identifying key benefits, important cooperative payoffs, and potential points of control.

Porter's market structure model [12] provides a basis for examining individual and organizational positions that the CIS is intended to connect. Rockart's Critical Success Factors approach [15] is used to describe the key interests and needs associated with each position. This analysis clarifies the constituent interests that the CIS must treat. Porter's Value Chain model provides a means for identifying areas where the CIS might link complementary needs. Lastly, we introduce a "value chain payoff matrix" as an aid in prioritizing potential CIS applications.

6.1. Identifying Strategic Goals

The hospital is under pressure in each area identified in Porter's model (see Figure 3):

- it has a poor location relative to competitors for attracting low-risk patients;
- it faces threats from large out-of-state specialty clinics, which are absorbing high-end business with their nationally-known expertise;
- the regional concentration of HMOs and large corporate health care plan sponsors is increasing;
- rising costs and higher overhead affect the health of physicians' practices that supply the hospital with patients, thus forcing them to seek higher prices, and
- walk-in clinics siphon off low-end business, offering substitute medical care without the burden of full hospital overhead.

The hospital's managers have developed strategies for dealing with these competitive factors as depicted earlier in Figure 3. Their decisions reflect (a) the industry's structure and how it is changing; (b) the options available to the hospital; (c) the choices that they prefer among those options; and (d) the consequences implied by those choices. In the hospital's case, for example, referrals represent a key link through physicians to the potential patient base -- and so to increased patient volume. The referrals, consultations, and library research services provided by PIN attempt to strengthen this hospital-physician connection.

A key factor in the success of CIS development lies in the organizational boundaries that system sponsors first choose to cross. PIN demonstrates that hospital management recognizes the need to build bridges in key areas between the hospital and its patient-providers. Management has closely examined the business needs of its physicians and is attempting to construct electronic services that emphasize areas where physician and hospital needs can be made to match.

6.2. Interlinked Value Chains

One way of expressing this process is to use Porter's "value chain" concept to represent the interests of each organization involved [11, 12]. Both the hospital's operations and the physician's practice can be described as moving through similar stages of providing service and earning surplus or profit. Using an industrial production operation as a metaphor, both hospital and physician engage in:

- Inbound logistics: For the hospital and its physicians, these activities center on gaining patients through referrals and other sources.
- Operations: The hospital provides the physicians with services and access to hospital equipment. The physicians provide patients and hospital with diagnosis, prescriptions, and operations.
- Outbound logistics: Discharges, billing, and cash flow considerations are important aspects of this value chain segment for both parties.
- Marketing and infrastructure: Value Chain categories also cover non-direct expenses such as marketing or overhead. Examining these aspects of hospital operations and the physicians' practices highlights the importance of referrals to each party, as well as emphasizing the importance of rapid collections to the hospital and of overhead expenses to the physicians.

An examination of inter- and intra-organizational value chains reveals relevant internal incentives -- particularly the characteristics of localized constituencies, their particular interests, and the threats they perceive from other organizational units. For example, the PIN Referrals application provides inbound logistics and marketing benefits to both hospital and physician. It makes the process of collecting patients faster and easier (inbound logistics). It also improves response time to referrals (making both hospital and physician look better in the patients' eyes) while providing important marketing information about the regional patient base. The linkages supported by several PIN services are shown in Figure 4. Each PIN application is carefully constructed by bridging common interests in these value chains.

6.3 Value Chain Payoff

Figures 5 categorizes bi-directional benefits, cooperative payoffs, and asymmetrical controls for four selected PIN applications in a value chain payoff matrix. The table suggests how each party gains from using the system; it can be used to analyze specific inter-organizational value chain linkages for their potential as target CIS boundary-crossings. Earlier we described how the referrals application takes advantage of bidirectional incentives, how scheduling can result in cooperative payoffs, and how

the separation of the design and the use of the system allows the hospital to gain from the asymmetrical controls. Similar results can be observed for the Pharmacy application and for other PIN applications not included in this matrix.

6.4 Incrementalism

The last column of the matrix, labelled "Factors Supporting Incrementalism," suggests organizational reasons for adopting a highly modularized, incremental, evolutionary approach to implementing each CIS application. It provides evidence for the importance of a careful match between what the organization needs and what the CIS technically provides (see Figure 2). In addition to emphasizing benefits and incentives, the system must grow with sensitivity towards those factors that might unduly threaten local interests. For example, it is probably preferable for the referrals network to grow slowly -- by example rather than by fiat. Forcing the physicians to use the network (attempting to apply an external incentive) might convince physicians that the hospital is trying to take advantage of them, leading to the establishment of informal referral networks that leave the hospital out of the loop.

Hospital management emphasizes that the system was first developed with an organizational need in mind, not a technical solution. The system hardware costs less than $100,000. -- an inconsequential figure for a hospital that runs two IBM mainframes with a Data Processing support staff of 80 people. Unix mail is at best an interim solution; the network has little security, no data validation, and few of the safeguards of the larger systems. The system, however, does match the hospital's organizational needs at the moment; it provides physicians and staff an adequately convenient interface to disparate hospital departments. New applications can be added in hours and days, not weeks. Starting small and growing as physicians' needs grow, the system can evolve over time as the organization changes.

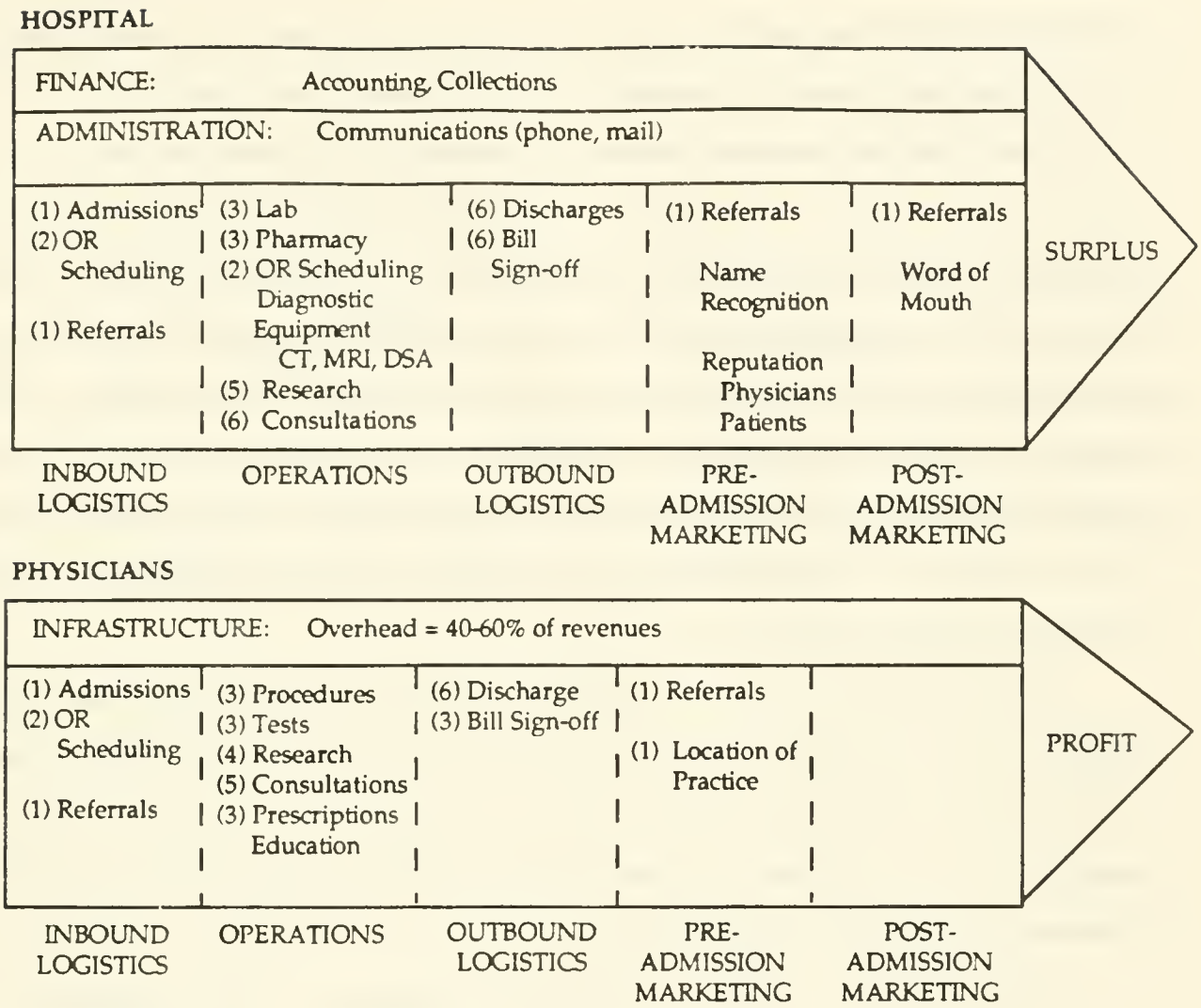

Figure 4 Selected Value Chain Items

7. SUMMARY AND CONCLUSIONS

As a first step we have used Porter's framework to describe the hospital's competitive position, as shown in Figure 3. This exercise highlights the compression of hospital margins between flattening third-party payment schemes and rising operating costs. It notes the potential local referral problems caused by the hospital's location. The next step superimposes a Critical Success Factors strategic response onto the five forces diagram. It emphasizes the importance of volume to the hospital as a way of fighting the revenue-cost squeeze, and suggests the importance of physician referrals to that strategy. It also adds the chronological aspect of the hospital's situation -- the institution needs to get

its physicians used to providing data now so that conversion to bulk data provision in the future (to satisfy third-party payers) will be possible.

Value Chain analysis suggests methods for identifying key organizational problems and potential solutions. Figure 4 diagrams the key value chains involved in the hospital-physician relationship, and shows how selected PIN applications make connections within and between them. The Value Chain Payoff Matrix (Figure 5) concentrates on organizational solutions by showing a method for identifying and prioritizing benefits or payoffs arising from value chain linkages. It can suggest areas in which system development should start – areas of highest potential. It can also suggest areas in which the hospital might benefit from asymmetrical controls. It details potential threats represented by each application to various parties -- threats that might argue for an evolutionary, incremental system design.

The hospital case in an evocative illustration for several reasons. First, it deals with a complex market; patients arrive at the hospital largely under the auspices of physicians' practices, and the characteristics leading to hospital preference are only partly known. Second, it focuses on a simple network that has complex organizational overtones: PIN is small but reaches across many boundaries, both inter- and intra-organizational.

Composite information systems cross organization boundaries by definition. Each boundary crossing implies elements of bidirectional benefits, cooperative payoffs, and asymmetrical controls. Bidirectional benefits affect organizational units individually, cooperative payoffs benefit the organization at the aggregate level, and asymmetric controls allow for the development of strategic dependencies. A CIS must emphasize the positive aspect of these relationships in order to be effective and stable. The PIN network provides an example of an organization doing so for strategic reasons.

NOTES

1. This common theme of the Human Relations school of management theorists emphasizes that top-down command techniques are in the long run of little use without the acquiescence and participation of managers and workers who must execute the orders. This bottom-up perspective was first described in this century by Barnard [2] and Roethlisberger and Dickson [16], but some of its basic ideas have existed for centuries (see Sun Tzu [19]). Current

organizational theorists also tend to subscribe to this view (see Pfeffer [10, p.16ff] and Brunsson [3]). Indeed, open systems organization models describe a world in which coercive incentives might be expected to have little long run effect (see Weick [20]; Scott [17] provides an overview).

2. Barnard [2] saw a manager's job in large part as setting up the proper mix of internal incentives for individuals who reported to him or her. Social psychologists such as Hackman and Oldham [7] have approached this problem from the point of view of work design, examining what characteristics of an individual's job might support internal incentives that improve organizational performance. Economic theorists have discussed hierarchical organization forms as a response to the cost of individual aggrandizement [21].

PIN Linkages (Applications)	Bi-directional Benefits		Cooperative Payoffs		Support for Asymmetrical Controls		Factors Supporting Incrementalism
	Physicians	Hospital	Physicians	Hospital	Physicians	Hospital	
Referrals and Consultations	Stronger practice; greater revenue	Higher volume for hospital; greater revenue	Better understanding of hospital's operations & problems	Tighter linkage to physicians	Have no time to learn technicalities of computing	Wants to build physician dependence	Must not alienate or pressure physicians into using network
			Savings in time and overhead	Savings in time and overhead	Want transparent network	Can build and service transparent network	Peer pressure and evolution strongest approaches
Scheduling OR, Admissions	More satisfied office staff	More productive hospital staff	Savings in time and overhead	Savings in time and overhead	Don't have expertise to run network	Can build and service transparent network	Office staffs themselves don't know what features they want, but will know as they use the system
			Want satisfied office staff and no way to solve problem	Want access to physician staff and no way to solve problem	Don't have consensus to run network		
Pharmacy	Savings in diagnostic time and costs	More productive pharmacy	Won't admit to needing medication advice, but might want some	Increasing need to reduce pharmacy inventory and costs	Don't have consensus on medications	Can ask advisory doctor to add comments even without consensus	Must distribute formulation and advisory knowledge without leaving impression that physicians have any diagnostic shortcomings
Laboratory	Better response time for patients	Better response time for physicians More productive lab	Have no control over lab operations	Have no knowledge of physicians' specific needs	Have neither time nor scale to set up own lab system	Can operate lab but need response flexibility	Cannot change lab procedures faster than lab staff can adjust

Figure 5. Value Chain Payoff Matrix

References

1. Axelrod, R., The Evolution of Cooperation, New York: Basic Books, 1984, p.8.
2. Barnard, C., The Functions of the Executive, Cambridge, MA: Harvard University Press, 1983.
3. Brunsson, N., The Irrational Organization: Irrationality as a basis for organizational action and change, New York, Wily, 1985.
4. Carnegie, D. How to Win Friends and Influence People, New York: Pocket Books, 1936.
5. Cohen, M.D.; March, J.G.; Olsen, J.P., A Garbage Can Model of Organizational Choice, Administrative Science Quarterly, v.17, March 1972, p.1-25.
6. Cyert, R.M.; March, J.G., A Behavioral Theory of the Firm, Englewood Cliffs, NJ: Prentice Hall, 1963.
7. Hackman, J.R., Oldham, G.R., Work Redesign, Reading, MA, Addison-Wesley, 1980.
8. Madnick, S.E. (ed.), The Strategic Use of Information Technology, Oxford University Press, Oxford, 1987.
9. Madnick, S.E. and Wang, Y.R., "A Framework of Composite Information Systems for Strategic Advantage," Proceedings of the Twenty-First Annual Hawaii International Conference on System Sciences, Vol.III (January 1988), pp.35-43.
10. Pfeffer, J. Organizational Design, Arlington Heights, IL: AHM Publishing Corporation, 1978.
11. Porter, M. and Millar, V.E., How information gives you competitive advantages. Harvard Business Review (July-August 1985) p. 149-160.
12. Porter, M. Competitive Advantage, Free Press, New York, NY, 1985.
13. Porter, M. Competitive Strategy: Techniques for analyzing industries and competition, NY: Free Press, 1980.
14. Quinn, J.B., Strategies for Change: Logical incrementalism, Homewood, IL: Richard D. irwin, Inc., 1980.
15. Rockart, J.F. "Chief Executives Define Their Own Needs," Harvard Business Review, Vol.57, No.2, March-April, 1979, pp. 81-93.
16. Roethlisberger, F.J.; Dickson, W.J., Management and the Worker, Cambridge, MA: Harvard University Press, 1939.
17. Scott, W.R., Organizations: Rational, Natural, and Open Systems (2nd edition), Englewood Cliffs, NJ: Prentice Hall, 1987.
18. Sirbu, M., and Stewart, S., "Market Structure and the Emergence of Standards," working paper, Department of Engineering and Public Policy, Carnegie-Mellon, University (October 1986).
19. Sun Tzu, The Art of War, London: Oxford University Press, translated by S.B. Griffith, 1963.
20. Weick, K. The Social Psychology of Organizing, NY: Random House, 1979.
21. Williamson, O.E., Markets and Hierarchies: Analysis and anti-trust implications, NY: Free Press, 1975.

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